



US DEPARTMENT OF DEFENSE

BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

Injury Models

Injury to the Retina and Brain Visual Centers by Primary Blast Waves

Exposure to blast shock waves is a leading cause of loss of vision in US Service Members. Blindness is a long-term disability that has a profound impact on the Service Member's quality of life. Researchers at WRAIR, with support from the USAMRMC TATRC Vision Research Program, have characterized the nature of blast wave injuries to the eyes (retina) and brain visual processing centers, and have explored therapies to halt the progression of neuronal cell degeneration. Using a rat model of whole-body exposure to blast over pressure in a shock tube, visual function is assessed by electroretinogram recordings, visual discrimination behavior testing, and eye and brain histopathology. Exposure to moderate pressure blast waves leads to marked visual system dysfunction that is associated with neuronal degeneration throughout the visual system (e.g., retina, optic tracts, and visual cortex). Novel drugs derived from omega (ω) - 3 and -6 polyunsaturated fatty acids (PUFA), which are known to be potent pro-resolving lipid mediators of inflammation, i.e., lipoxins, neuroprotectins, and resolvins, are being evaluated for therapeutic efficacy. Despite improvements in visual function, treatments have not impacted neuronal cell degeneration in the retina and brain, prompting targeted drug delivery using nanoparticle platforms to eliminate drug stability and tissue permeability issues.